INVERTEBRATE STUDIES AT S'ALBUFERA NATURAL PARK

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Work was begun in spring 1989 to obtain en inventory of invertebrates present in the Park, to investigate the composition of invertebrate fauna in relation to habitat and to physical and seasonal variables, and to establish methodology designed to evaluate long-term changes in numbers and species compositions. Groups chosen for study were arachnids, Coleoptera, Lepidoptera, Odonata and freshwater invertebrates, syrphids (Diptera) and terrestrial molluscs. The work was part of *Project S'Albufera,* a monitoring programme for long-term environmental change, organised by Earthwatch Europe.
Keywords: Invertebrates, monitoring, environmental change

El treball va començar la primavera de 1989 amb l'objectiu, per una banda, d'inventariar els invertebrats presents en el Parc, investigar la composició de la fauna d'invertebrats en relació a l'hàbitat i a les variables físiques, així com la seva estacionalitat; per altra banda establir un disseny metodològic per a avaluar canvis de llarg termini en el nombre i composició d'espècies. Els grups elegits per a l'estudi foren aràcnids, coleòpters, lepidòpters, odonats i invertebrats d'aigua dolça, sírfids (Diptera) i mol·luscs terrestres. El treball forma part del *Project S'Albufera,* un programa de seguiment de llarg termini del canvi ambiental organitzat per Earthwatch Europe.
Paraules Clau: Invertebrats, seguiment, canvi ambiental.

As part of a full and detailed ecological research programme at S'Albufera Natural Park, initiated in spring 1989 to monitor for long-term environmental change, several invertebrate groups were studied. The work was carried out from 30th March to 27th May in 1989 and 3rd April to 21th May in 1990. The aims were:

1. To document the range of species present in the Park.

2. To investigate variations in the composition of invertebrate fauna in relation to habitat and to physical and seasonal variables.

3. To evaluate long-term changes in numbers and species compositions in selected habitats.

Study was begun in 1989 of arachnids, Coleoptera, Lepidoptera, Odonata and freshwater invertebrates. Additions in 1990 com-

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Larva d'*Apatele rumicis*
(Foto J. Mayol)

prised syrphids (Diptera) and terrestrial molluscs.

Arachnids

Three lines of pitfall traps were installed in recently burnt and relatively dry marsh at Ses Puntes, in the wetter *Phragmites* marsh of es Ras and in the fossil dunes immediately north of the abandoned farm of Ses Puntes. Each line consisted of the plastic pitfall traps sunk into the ground at 5m intervals and with their rims flush with the soil surface. Initially the pitfalls were used dry and inspected at 24 hour intervals. Latterly the traps were half-filled with a mixture of domestic detergent and ethylene glycol. This had the advantage of retaining the arthropods caught and preserving them against decay. It also prevented predation within the cath. The traps were then inspected at 5 day intervals.

Analysis of the cath is still in progress, but the marsh pitfall traps yielded female *Pirata latitans* (Lycosidae) and at least three other species of lycosid spider, five males of *Argenna patula* (Dictynidae), single males of *Maso gallica* (Linyphiidae) and *Erigone dentipalpis* (Linyphiidae), and 3 males and 4 females of *Gnathonarium dentatum* (Linyphiidae). The line of pitfalls in the fossil dunes yielded a number of small spiders yet to be identified.

Coleoptera

The three lines of pitfall traps used trapping spiders also produced a sample of beetles. Analysis of the beetle cath is still in progress, but the pitfall traps at the two marsh sites yielded at least three species of Carabid and the line in the fossil dunes yielded a number of small carabid, staphylinid and tenebrionid beetles. The collections will provide a baseline for future studies.

Lepidoptera

Butterfly species and numbers were censused regularly along a fixed route 5.5 km long. Censuses were done on days of calm, dry weather. The route was walked and butterflies within a 5 m distance of the observers counted. The activity of each butterfly was recorded using the three categories "settled", "territorial" and "moving through".

More species were recorded in 1990 than in 1989. Species recorded in both years were *Colias crocea, Pieris brassicae, Pieris*

Adult de *Colias crocea*
(Foto J. Mayol)

rapae, Pontia daplidice, Lycaena phlaeas, Polyommatus icarus, Celastrina argiolus, Vanessa atalanta, Cynthia cardui, Pararge aegeria and *Coenonympha pamphilus.* One species, *Aricia cramera,* was only recorded in 1989 and *Papilio machaon, Leptidea sinapis, Colias hyale, Gonepteryx cleopatra, Lampides boeticus* and *Lasiommata megera ssp. paramegaera* only in 1990. An additional species, *Callophrys rubi*, was present in both years in wooded parts of the coastal dunes but was not recorded on the census route.

In May 1990, a start was made to establish a reference collection of the moth fauna of S'Albufera. Moths were trapped using a portable actinic moth trap powered by a 12 volt car battery. The trap was used on most nights and at various locations in the vicinity of Sa Roca. Best results were obtained by placing the trap on the top of the observation mound, allowing the light to be cast over a wider area of reed bed. This particularly increased the number of captures of *Mythimna* species, a group whose larvae feed mainly on and in the stems of marsh plants such as *Phragmites*. A provisional list of species trapped and established in the reference collection comprises *Oncocera semirubella, Scopula nigropunctata, Orthonama vittata, Xanthorhoe fluctuata, Thera firmata, Hydriomena impluviata, Horisme vitalbata, Eupithecia centaureata, Menophra abruptaria, Macroglossum stellatum, Hyles euphorbiae, Cerura vinula, Agrotis segetum, Ochropleura plecta, Lacanobia oleracea, Orthosia stabilis, Mythimna l-album, Mythimna unipuncta, Mythimna obsoleta, Acronicta psi, Eublemma ostrina, Autographa gamma, Lygephila pastium* and *Hypena obsitalis.*

Odonata

Dragonfly species and numbers were censused at the same time and on the same route as that used for the butterfly census. Species recorded in both years were *Ischnura elegans, Anaciaeschna isosceles, Anax imperator, Orthetrum cancellatum* and *Sympetrum sanguineum.* Species recorded for the first time in 1990 were *Ceriagrion tenellum, Anax parthenope, Libellula depressa, Crocothemis erythraea* and *Sympetrum striolatum.* An additional species, *Coenagrion lindenii* was present at one locality in the Park in 1990 but was not recorded on the census route.

Freshwater Invertebrates

Because they are known to have specific salinity tolerances, certain aquatic invertebrates can act as indicators of the transition between fresh, brackish and saline water. The distribution of these species can

also lead to a better understanding of the overall hydrology of the marsh system, particularly any saline intrusion as a result of the fluctuation in freshwater inputs.

Studies were conducted by net-sampling invertebrates, by recording colonisation of sampling squares anchored in selected sites in 1989, and by canal transects. Sites chosen for net-sampling were canal junctions, the mid point of canals and points near inflows to and outflows from the marshes. Wherever sampling took place, samples were also taken of conductivity, pH levels and aquatic macrophytes. Choice of sample sites was influenced by, and often corresponded with, sites studied for variety and amount of macrophytic growth by Dr. Antoni Martínez of the Universitat de les Illes Balears who also related his results to water quality.

Canal transects were done from a boat in as many canals as possible, usually near junctions with other canals. The technique comprised information of the canal profile by measurements of depth at metre intervals, net-sampling for middle and bottom layer aquatic invertebrates and identity, height and density of aquatic macrophytes at the same metre intervals.

Hoverflies (Syrphids)

No regular survey was set up to investigate the hoverfly fauna of the park but in 1990, in the course of other survey work, a few specimens werer collected to provide the start of a reference collection. They were *Melanostoma scalare* (female), *Platycheirus fulviventris* (2 males and one female), *Chrysotoxum* species, *Episyrphus balteatus, Sphaerophoria rueppelli* (male), *Sphaerophoria scripta, Sphaerophoria species* (female) and *Syritta pipiens.* In addition one unidentified *Syrphus* and one unidentified *Eristalis* species were seen but not caught. In Britain, where their habits are best known, *Platycheirus fulviventris* is strongly associated with lush open marsh and *Sphaerophoria rueppelli* with grassy flood embankments of a major river (the Thames). Our initial observations were that S'Albufera may support a depauperate hoverfly fauna compared with mainland sites.

Terrestrial Molluscs

A study of terrestrial molluscs was begun in May 1990. A quadrat search method was used. One-metre quadrats were placed at 10 metre intervals along two fixed transect lines in the dunes and randomly in a variety of other habitats. Each quadrat was searched for 10 minutes for all live specimens on the ground and vegetation, and species and number of live specimens recorded. Species identified were *Tudorella ferruginea, Succinia putris, Oxychilus lentiformis, Limax valentianus, Helix aspersa, Cochlicella acuta, Xerocrasa nyeli, Eobania vermiculata,* and *Theba pisana.*

Future Work

Understanding the invertebrate fauna of S'Albufera and determining which are the principal species requires an initial programme of routine collection, to build up a reference library of specimens, photographs and faunal lists. An on-site reference collection of specimens has been initiated, but is currently restricted to moths and hoverflies. Further work is planned to establish comprehesive reference material for those two insect groups and to extend the collection to other representative invertebrate taxa. For large and obvious species, such as Odonata and day-flying Lepidoptera, a photographic library will be created as the form of reference. Knowledge of the Park's invertebrates is considered essential to our studies and work begun to record species on index card is planned eventually to include as comprehensive a list as possible of invertebrate species known to occur at S'Albufera.

We consider that the establishment of a comprehensive data base, and continued monitoring of major invertebrate groups in relation to habitat preferences and temporal, seasonal and physical variables, will help

identify the key faunal groups with which to assess one of the most important aims of the entire project to evaluate long-term environmental change.

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